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DISCLOSURE TITLE: Area Array Substrate-To-Carrier Interconnection Using
Corner Standoff

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DISCLOSURE TEXT:

- A method for achieving adequate solder joint height for reliable interconnections when joining materials with different expansion rates is described. Electronic packaging methodology is migrating from "pin-in-hole" to surface-soldered components to achieve increased circuit density, wireability and performance. It is desirable to adapt leaded **chip** carrier technologies (i.e., multilayer ceramic (MLC) and thin-film or metallized ceramic (MC) modules) to leadless surface-mounted versions. A major technical problem in doing this is the mismatch in thermal expansion rates between the **ceramic substrates** and organic laminates. The approach utilizes a metal column to absorb the shear strain between substrate and organic carrier. The attachment method involves the use of **corner standoffs** on the substrate in conjunction with all eutectic solder joints. The figure illustrates the method. A square or rectangular **ceramic chip carrier or substrate** 1 is to be attached to an organic laminate component carrier 2. A plurality of electrical interconnections are required between the **ceramic substrate** and organic carrier. High reliability interconnections are achieved through the use of tall, all-eutectic solder joints 3. The solder joint height needed for reliability is achieved using standoffs 4 on

the four corners of the module. Claims and Process Methods

1. Since cracking of solder joints is a major reliability concern, the fatigue life of the solder joints must be maximized.

- Eutectic (63% Sn 37% Pb) solder has excellent fatigue life. The fatigue life is also related to the height of the solder column; hence an optinum height must be attained to maximize reliability.

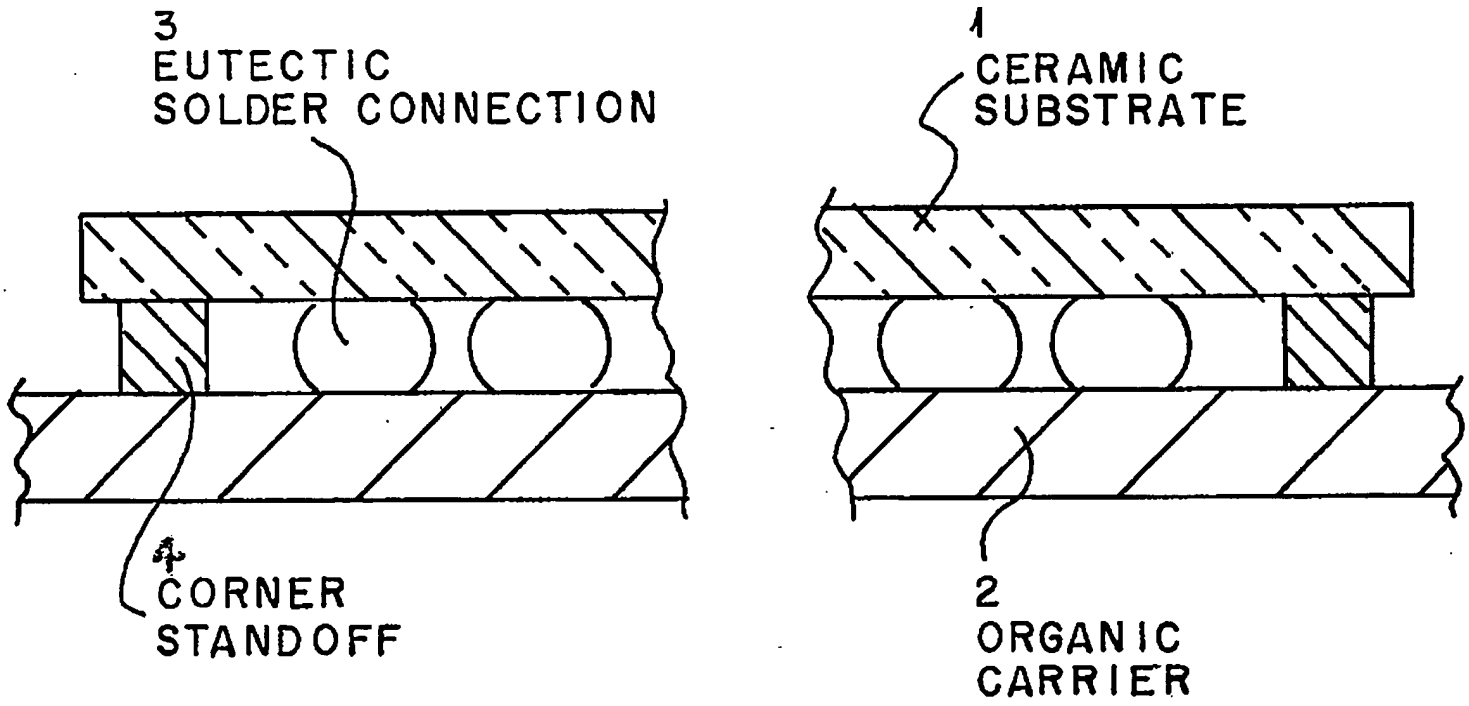
2. Collapse of the solder column during reflow would cause unacceptably low joint height without the use of a standoff.
3. The process for creating the solder connections is not unique. Eutectic **balls** can be reflowed onto the substrate and joined to the card with or without additional solder provided through screened paste. Other methods, such as vapor deposition or plating, are conceivable, but probably not cost competitive in providing the needed alloy purity.
4. There are many methods for providing the corner standoffs.

They may be short or sheared pins on the substrate. These would be brazed on MLC substrates and press fit on MC substrates. These "stubby" pins may or may not be soldered to the carrier.

5. The standoff height provided is also useful for easing cleaning under the substrate.
6. The standoffs may also be formed as part of the substrate during its firing. Also, metallic or non-metallic "posts" may be attached by an adhesive.
7. The reliability (fatigue life) attainable with this method is superior to that of an area array of short ("stubby") pins soldered to the carrier materials. 8.

This method is readily adaptable to other solder metallurgies, conductive epoxy connections, and to other **chip** carrier and substrate carrier materials.

exempt
from FOIA disclosure per 5 U.S.C. 552(b)(4) and protected under the Trade
Secrets Act, 18 U.S.C. 1905.


3
EUTECTIC
SOLDER CONNECTION
4
CORNER
STANDOFF
1
CERAMIC
SUBSTRATE
2
ORGANIC
CARRIER